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Patent Claims

- 5 1. A multi-cylinder internal combustion engine for a  
motor vehicle, having an exhaust line which is assigned  
to the cylinders of the internal combustion engine (B),  
the cylinders (1 - 6) each being assigned a gas inlet  
valve (E) which is used for the charge cycle and has  
10 the purpose of letting combustion air into the  
combustion chamber of the cylinder and a gas outlet  
valve (A) which is used for the charge cycle and has  
the purpose of letting exhaust gases out of the  
combustion chamber and into the exhaust line, and at  
15 least one of the cylinders (1 - 6) of the internal  
combustion engine (B) having an additional outlet valve  
(Z) through which, in the opened state, a flow  
connection is established between the combustion  
chamber and the exhaust line, characterized in that an  
exhaust gas cleaning unit is arranged in the exhaust  
line, an exhaust gas composition and/or exhaust gas  
temperature which are changed compared to the normal  
operating mode and promote the regeneration of the  
exhaust gas cleaning unit being able to be set in  
25 conjunction with a regeneration operating mode for  
regenerating the exhaust gas cleaning unit by  
activating the additional outlet valve (Z) of at least  
one cylinder (1).
- 30 2. The internal combustion engine as claimed in  
claim 1, characterized in that when the additional  
outlet valve (Z) is activated at least one cylinder can  
be operated with a fuel supply which is reduced  
compared to the operating mode without activation of  
35 the additional outlet valve (Z).
3. The internal combustion engine as claimed in  
claim 1 or 2, characterized in that when there is at

least one cylinder with an additional outlet valve (Z) the additional outlet valve (Z) can be activated in a clocked fashion such that when there are a multiplicity of working cycles the additional outlet valve (Z) is 5 opened in each case in the region of the top dead center in the compression stroke and is otherwise closed.

10 4. The internal combustion engine as claimed in one of claims 1 to 3, characterized in that a cylinder group (11) which is formed from at least two preferably adjacent cylinders with an additional outlet valve is provided.

15 5. The internal combustion engine as claimed in one of claims 1 to 4, characterized in that when there are at least two preferably adjacent cylinders with an additional outlet valve (Z) there is provision for the additional outlet valve (Z) to be activated.

20 6. The internal combustion engine as claimed in one of claims 1 to 5, characterized in that at least two cylinders are provided with an additional outlet valve, and the number of cylinders at which the additional 25 outlet valve (Z) is activated can be set in a variable fashion, in particular as a function of the exhaust gas temperature.

30 7. The internal combustion engine as claimed in one of claims 1 to 6, characterized in that when there is at least one cylinder with an additional outlet valve (Z), operation with a closed additional outlet valve (Z) and with a fuel supply which is reduced compared to the normal operating mode becomes possible.

35 8. The internal combustion engine as claimed in one of claims 1 to 7, characterized in that the regeneration operating mode can be set when the

additional outlet valve (Z) of at least one cylinder (1) is activated in an operating range with reduced power output by the internal combustion engine (B).

5 9. The internal combustion engine having an exhaust gas turbocharger as claimed in one of claims 1 to 8, characterized in that it becomes possible for the charge pressure to be influenced in conjunction with a regeneration operating mode.

10 10. The internal combustion engine having an adjustable exhaust gas recirculation device as claimed in one of claims 1 to 9, characterized in that it becomes possible for the quantity of recirculated 15 exhaust gas to be influenced in conjunction with a regeneration operating mode.

20 11. The internal combustion engine as claimed in one of claims 1 to 10, characterized in that the regeneration operating mode is provided when the vehicle is stationary.

25 12. A method for operating a multi-cylinder internal combustion engine for a motor vehicle, having an exhaust line which is assigned to the cylinders of the internal combustion engine (B), the cylinders (1 - 6) each being assigned a gas inlet valve (E) which is used for the charge cycle and has the purpose of letting combustion air into the combustion chamber of the 30 cylinder and a gas outlet valve (A) which is used for the charge cycle and has the purpose of letting exhaust gases out of the combustion chamber and into the exhaust line, and at least one of the cylinders (1 - 6) of the internal combustion engine (B) having an 35 additional outlet valve (Z) through which, in the opened state, a flow connection is established between the combustion chamber and the exhaust line, characterized in that the additional outlet valve (Z)

of at least one cylinder is opened at least temporarily in conjunction with a regeneration operating mode for regenerating an exhaust gas cleaning unit which is arranged in the exhaust line.

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13. The method as claimed in claim 12, characterized in that at least one cylinder is operated with an at least temporarily opened additional outlet valve (Z) and with a fuel supply which is reduced compared to the  
10 normal operating mode.

14. The method as claimed in claim 12 or 13, characterized in that the additional outlet valve (Z) of at least one cylinder is kept open in the region of  
15 the top dead center in the compression stroke, and otherwise kept closed, during a multiplicity of working cycles of the cylinder.

15. The method as claimed in one of claims 12 to 14,  
20 characterized in that the additional outlet valve (Z) of at least one cylinder is kept continuously open during a multiplicity of working cycles of the cylinder.

16. The method as claimed in one of claims 12 to 15,  
25 characterized in that at least one cylinder of the internal combustion engine (B) is operated with a fuel supply which is reduced compared to the normal operating mode.

30 17. The method as claimed in one of claims 12 to 16, characterized in that at least two preferably adjacent cylinders are provided with an additional outlet valve (Z) and their additional outlet valves (Z) are activated synchronously.

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18. The method as claimed in one of claims 12 to 17, characterized in that at least two cylinders are provided with an additional outlet valve (Z), and the

number of cylinders with an at least temporarily opened additional outlet valve (Z) is set as a function of the load of the internal combustion engine.

5 19. The method for operating an internal combustion engine having an exhaust gas turbocharger as claimed in one of claims 12 to 18, characterized in that a reduced charge pressure is set in conjunction with the regeneration operating mode.

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20. The method for operating an internal combustion engine having an adjustable exhaust gas recirculation device as claimed in one of claims 12 to 19, characterized in that an increased quantity of 15 recirculated exhaust gas is set in conjunction with the regeneration operating mode.

21. The method as claimed in one of claims 12 to 20, characterized in that the regeneration operating mode 20 is carried out when the vehicle is stationary.